1965 ANNUAL REPORT

ARCTIC-YUKON-KUSKOKWIM AREA

ALASKA DEPARTMENT OF FISH AND GAME

DIVISION OF COMMERCIAL FISHERIES

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I N T R O D U C T I O N

The Arctic-Yukon-Kuskokwim Area, as shown in Figure 1, is that portion of the State north of the Alaska Range and the Bristol Bay drainage. This is the largest management area in the State and is equal to the combined areas of California, Oregon, Washington, and Idaho.

A total of 955 licensed commercial fishermen harvested 144,512 king, 1,886 red, 14,571 coho, 220 pink and 104,388 chum salmon during the 1965 season. In addition, 1,163 subsistence fishermen were surveyed by the Department and a resultant catch of 45,376 king, 1,804 red, 5,881 coho, 21,244 pink and 771,442 chum salmon was recorded. Table 1 shows the 1965 commercial and subsistence catch by district.

During 1965 approximately $672,000 was paid to fishermen in the Arctic-Yukon-Kuskokwim Area for salmon sold commercially. Wages earned by cannery workers, tender boat operators, etc. are not known but add considerably to the economic importance of the commercial fishery. In this area of low indust rialization, such income is of major significance.

The State received approximately $62,000 in processing taxes and license revenues as a result of the 1965 commercial fishery. The first wholesale value of the A-Y-K salmon pack (all products) is estimated to be just slightly under $2,000,000.

A minimum total of 845,747 salmon were taken for subsistence purposes during the 1965 season. In terms of money required to purchase a similar quantity of meat substitute, the subsistence catch is of equal or greater importance than the commercial catch. Because of its importance, the Arctic-Yukon-Kuskokwim area subsistence fishery influences management to a great extent.

Table 2 lists the A-Y-K Area buyers, processors, and associated data and Table 3 shows the 1965 pack for each species.

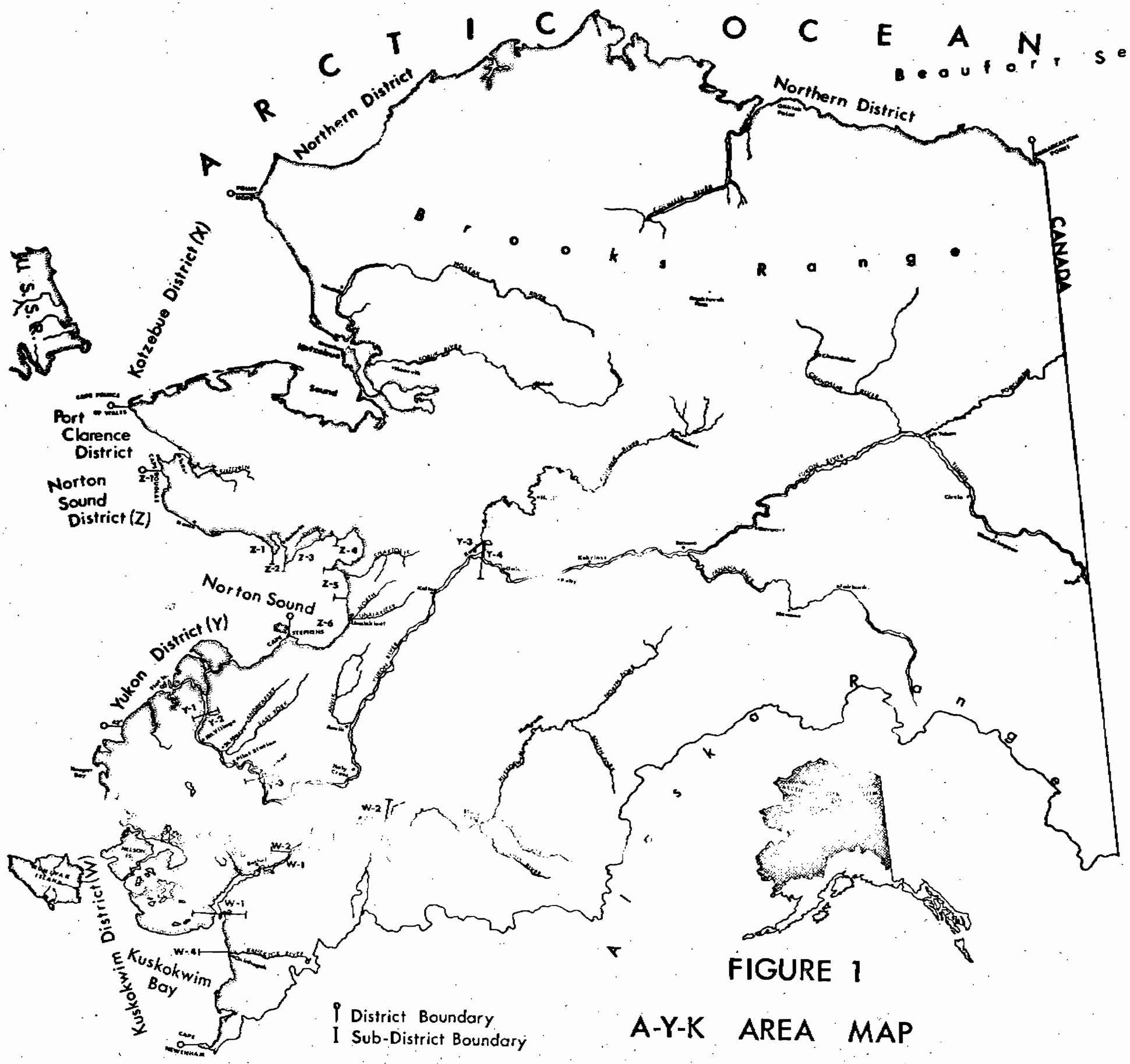


FIGURE 1

A-Y-K AREA MAP

TABLE 1

ARCTIC-YUKON-KUSKOKWIM AREA TOTAL SALMON CATCH BY DISTRICT 1965 1/

	Kings	Reds	Cohos	Pinks	Chums
KUSKOKWIM:					
Commercial	21,989		12,191	-	-
Subsistence	25,043	-	-	-	250,878 2/
SUB-TOTAL	47,032		12,191		250,878
KANEKTOK:					
Commercial	2,976	1,886		-	4,242
Subsistence	-	-	-	-	-
SUB-TOTAL	2,976	1,886			4,242
YUKON:				-	
Commercial	118,098	-	350		23,317
Subsistence	19,723	-	430	259	457,690
SUB-TOTAL	137,821		780	259	481,007
NORTON SOUND:					
Commercial	1,449	-	2,030	220	36,795
Subsistence	574	-	4,812	19,131	30,772
SUB-TOTAL	2,023		6,842	19,351	67,567
PORT CLARENCE:					
Subsistence	36	1,804	639	1,854	1,602
KOTZEBUE:					
Commercial	-	-	-	-	40,034
Subsistence	-	-	-	-	30,500
SUB-TOTAL					70,534
GRAND TOTAL FOR A-Y-K AREA 3/					
1965	189,888	3,690	20,452	21,464	875,830
1964	171,070	16,846	41,187	30,918	962,793

1/ The Kanektok Subdistrict is shown separately 2/ Chums and reds combined
3/ 1965 subsistence catches not documented in Kanektok Subdistrict

TABLE 2

1965 ARCTIC-YUKON-KUSKOKWIM AREA PROCESSORS AND ASSOCIATED DATA

Commercial Operator	Product	Fish Per Case	Price Paid to Fishermen	District
Bering Sea Fisheries, Inc. 611 Lowman Building Seattle, Washington	Canned 1# Talls Chums	10.0	$ .45 Per Fish	Kotzebue
Western Alaska Enterprises, Inc. 825 West Eighth Avenue Anchorage, Alaska	Fresh Salmon Chums		.50 Per Fish	Kotzebue
Rotman Seafoods, Inc. Kotzebue, Alaska	Fresh Salmon Chums		.50 Per Fish	Kotzebue
Bruce Crow Bethel, Alaska	Fresh Salmon Kings Cohos		3.50 Per Fish .35 Per Fish	Kuskokwim
Kuskokwim Packing Company 1844 Westlake Avenue North Seattle, Washington	Mild Cured Salmon Kings Fresh Salmon Reds Cohos		3.50 Per Fish .50 Per Fish .40 Per Fish	Kuskokwim
George Schenk 2408 Peabody Street Bellingham, Washington	Fresh Salmon Kings Reds Cohos Chums		3.50 Per Fish .50 Per Fish .40 Per Fish .35 Per Fish	Kuskokwim

TABLE 2 (Cont.)

Commercial Operator	Product	Fish Per Case	Price Paid to Fishermen	District
Swanson Brothers Bethel, Alaska	Frozen Salmon Kings Cohos		 $3.50 Per Fish .40 Per Fish	Kuskokwim
Bethel Trading Company Bethel, Alaska	Fresh Salmon Kings		 3.50 Per Fish	Kuskokwim
Northern Commercial Company Bethel, Alaska	Fresh Salmon Kings		 3.50 Per Fish	Kuskokwim
Clark Fishing Enterprises Aniak, Alaska	Fresh Salmon Kings Cohos		3.50 - 5.00 Per Fish .50 Per Fish	Kuskokwim and Yukon
Northern Commercial Company 419 Colman Building Seattle, Washington	Mild Cured and Hard Salt Kings		 4.50 Per Fish	Yukon
Yukon Fishing and Transportation Co. Box 487 Nenana, Alaska (Smithy Slough)	Mild Cured Salmon Kings		 4.50 Per Fish	Yukon
John Amukon Scammon Bay, Alaska	Mild Cured and Hard Salt Kings		 3.75 Per Fish	Yukon
Mountain Village Fish Company Mountain Village, Alaska	Canned 1/2# Flats Kings	?	 4.5? Per Fish	Yukon

TABLE 2 (cont.)

Commercial Operator	Product	Fish Per Case	Price Paid to Fishermen	District
Point Adams Packing Company Hammond, Oregon	Canned 1# Ovals and Canned 1/2# Flats Kings	3.3	$4.50 Per Fish	Yukon
Yukon Packers 1032 Eighth Avenue Fairbanks, Alaska	Canned 1/2# Flats Kings	3.3	4.50 Per Fish	Yukon
Weisner Trading Company Rampart, Alaska	Canned 1# Flats and Talls, Canned 1/2# Flats Kings	?	4.50 Per Fish	Yukon
Badger Cold Storage 1/2 Mile Badger Road Fairbanks, Alaska	Fresh, Frozen, Mild Cured and Hard Salt Salmon Kings Cohos		4.50 Per Fish .40 Per Fish	Yukon
Paul A. Desrochers 250 Charles Street Fairbanks, Alaska	Fresh, Frozen, and Mild Cured Salmon Kings		4.50 Per Fish	Yukon
Pitkas Point Packing Company 1844 Westlake Avenue North Seattle, Washington	Canned 1# Flats and Mild Cured Kings	3.3	4.50 Per Fish	Yukon
Polar Fisheries 1500 Westlake Avenue North Seattle, Washington	Frozen Salmon Kings		4.50 Per Fish	Yukon

TABLE 2 (cont.)

Commercial Operator	Product	Fish Per Case	Price Paid to Fishermen	District
Bill's Fish Wagon 2111 Southern Aurora Subdivision Fairbanks, Alaska	Fresh Salmon Kings		$4.50 Per Fish	Yukon
Don E. Jonz P.O. Box 625 College, Alaska	Fresh Salmon Kings		4.50 Per Fish	Yukon
Smokey Joes, Inc. Seward Highway Anchorage, Alaska	Fresh Salmon Kings Chums Cohos		3.75 Per Fish .40 Per Fish .45 Per Fish	Norton Sound
Seward Peninsula Products Co. P.O. Box 723 Nome, Alaska	Fresh Salmon Whitefish Char		?	Norton Sound and Port Clarence

TABLE 3

ARCTIC-YUKON-KUSKOKWIM AREA
PACK BY SPECIES, 1965

Species	Cases (48# Case)	Mild Cure and Hard Salt		Frozen Fish	Fresh Fish
		Full Tierces	Half Tierces		
King Salmon	18,149	907	67	11,263	9,826
Chum Salmon	1,929	-	-	22,758	63,780
Red Salmon	-	-	-	-	1,886
Coho Salmon	-	-	-	689	14,298
Pink Salmon	-	-	-	-	66

S E C T I O N I

M A N A G E M E N T

Y U K O N D I S T R I C T

KING SALMON COMMERCIAL FISHERY

Introduction: This district includes all waters of the Yukon River and its tributaries and all coastal waters including Stuart Island from Cape Stephens southward to 62° N. latitude. Commercial fishing for salmon is permitted upstream from the mouths of the Yukon and Black Rivers.

A commercial fishery was first established in 1918 and has continued each year with the exception of the period 1925 to 1931. Prior to 1961 the commercial fishery was restricted to catch quotas of varying sizes; a quota of 50,000 kings was in effect during most years. During the period 1954 through 1960, a 65,000 king salmon quota was divided between the following areas of the river: 50,000 kings below the mouth of the Anuk River, 10,000 between the mouths of the Anuk and Anvik Rivers, and 5,000 above the mouth of the Anvik River. Commercial fishing was allowed for five and one-half days a week until the quota was taken.

Since 1961 quotas have been removed for that portion of the river below Owl Slough near Marshall and this fishery has been regulated by scheduled openings and closures each week. Limited quotas still are in effect for areas above Owl Slough.

Although the duration of fishing periods have been altered somewhat during the past five seasons, a total of four days a week has been open to commercial fishing in subdistricts#1 and #2 during the king salmon season. For the past three seasons the commercial fishing periods have been as follows: 6 a.m. Monday to 6 a.m. Wednesday and 6 p.m. Thursday to 6 p.m. Saturday in

subdistrict #1 and 6 p.m. Sunday to 6 p.m. Tuesday and 6 a.m. Thursday to 6 a.m. Saturday in subdistrict #2. All fishing gear (commercial and subsistence) must be removed from the river during weekly closures.

Commercial fishing in subdistrict #3 is allowed for a total of four days a week (6 p.m. Monday to 6 p.m. Friday) until a quota of 3,000 kings is taken. In subdistrict #4 commercial fishing is allowed seven days a week until a quota of 2,000 king salmon is taken.

1965 Fishery: The commercial king salmon season was closed by field announcement effective 6 p.m. July 3 in subdistrict #1 and 6 a.m. July 3 in subdistrict #2. King salmon quotas in both of the upper subdistricts were taken; the sale of king salmon was prohibited after 6 p.m. on June 25 in subdistrict #3 and after July 27 in subdistrict #4. A total of 1,863 kings were turned in on fish tickets but known sales, not recorded on fish tickets, brought the total subdistrict #4 catch to slightly over 2,000 kings.

The number of licenses issued for the Yukon district is shown in Table 12. A total of 539 fishermen, 486 fishing vessels, 9,915 fathoms of drift gill net and 40,220 fathoms of set gill net were licensed.

During the 1965 season, a total of 118,098 king salmon were harvested for commercial purposes. This represents the second largest catch in the history of this fishery, the 1961 catch being the largest. The 1965 catch was divided between subdistricts as follows: 89,268 in subdistrict #1, 23,763 in subdistrict #2, 3,204 in subdistrict #3, and 1,863 (recorded on fish tickets) in subdistrict #4.

Tables 13 through 16 present daily catch and fishing effort data for the above subdistricts. In addition, Table 17 shows the total catch and catch per boat hour for statistical areas within subdistricts #1, #2 and #3. Figures 2

TABLE 12

NUMBER OF COMMERCIAL FISHING LICENSES
ISSUED FOR YUKON DISTRICT, 1965

	Commercial	Vessel	Set Net	Drift Net	Tenders
Subdistrict #1	327	322	292(32980)	62(3615)	-
Subdistrict #2	143	111	98(5410)	98(6050)	-
Subdistrict #3	34	26	23(1480)	4(250)	-
Subdistrict #4	35	27	7(350)	-	-
Totals, 1965	539	486	420(40220)	164(9915)	27
Totals, 1964	487	451	409(39510)	159(9450)	17
Totals, 1963	451	413	407(37860)	114(8210)	22
Totals, 1962	533	490	434(42935)	177(11680)	23
Totals, 1961	412	350	338(32351)	103(6055)	18

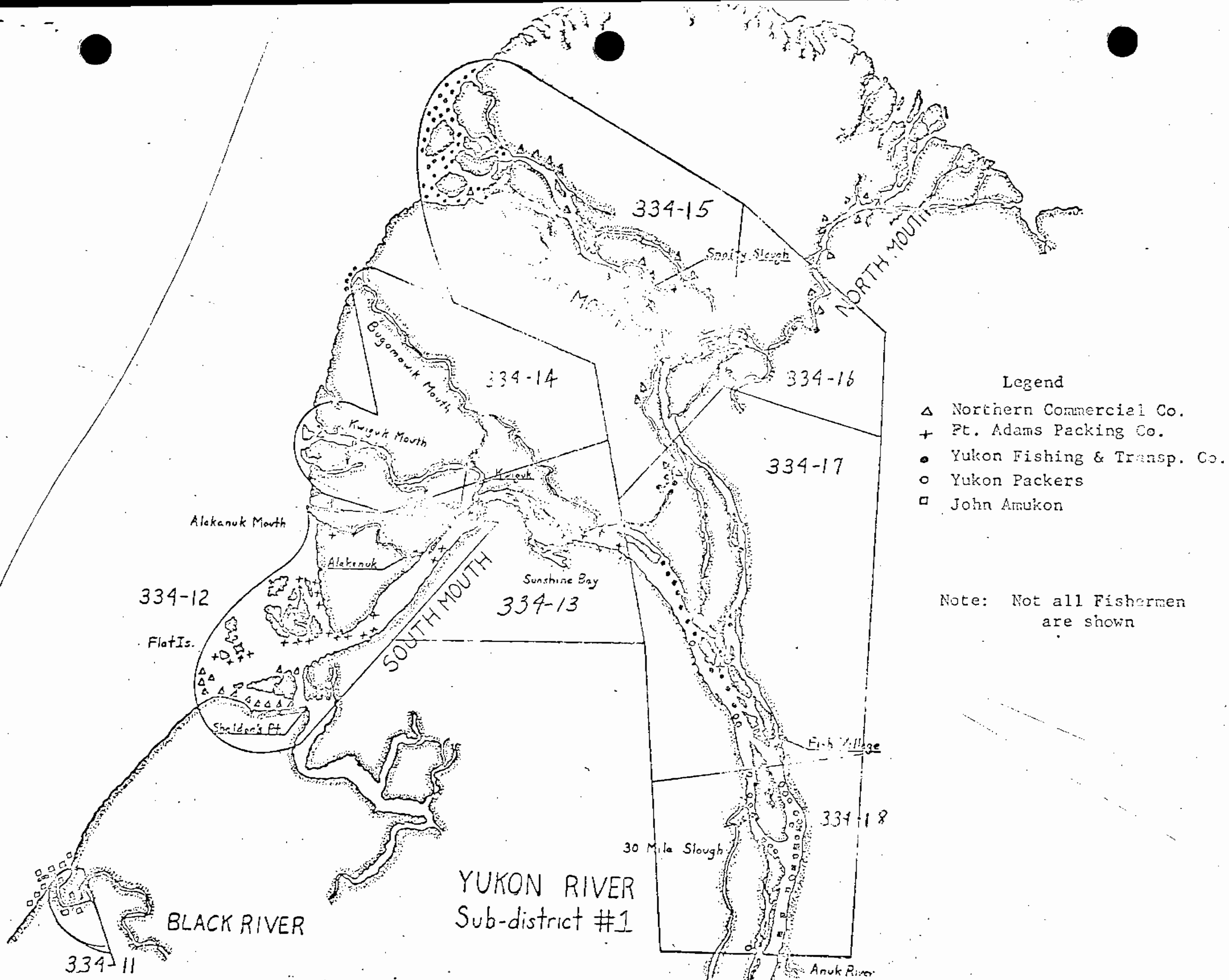
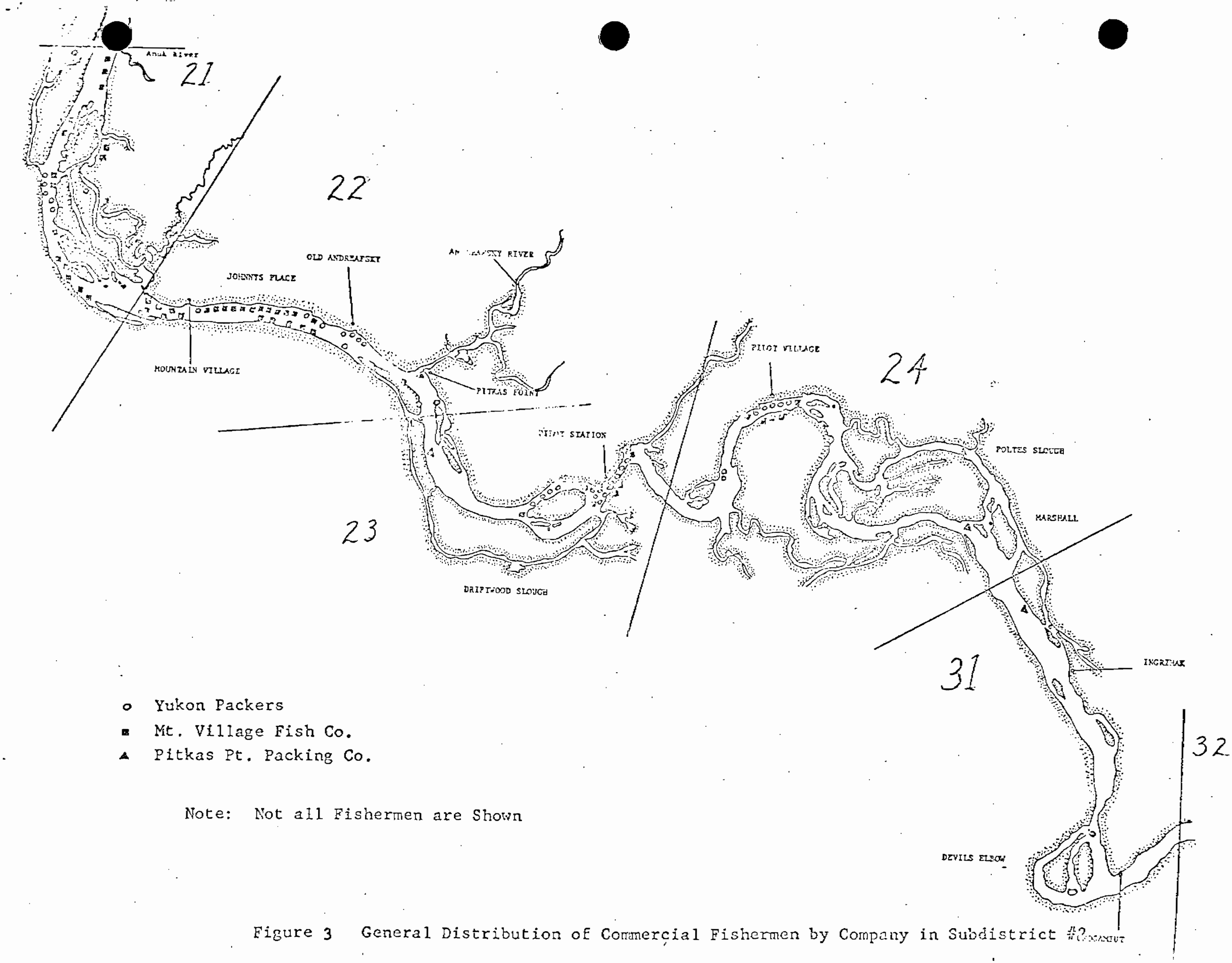


Figure 2 General Distribution of Commercial Fishermen by Company in Subdistrict #1



Note: Not all Fishermen are Shown

Figure 3 General Distribution of Commercial Fishermen by Company in Subdistrict #2

and 3 illustrate boundaries of these statistical areas and also show the general distribution of fishermen by company.

Approximately 18,149 cases (48# case) were locally processed by five canneries. King salmon packed in subdistrict #1 and #2 averaged 3.2 to 3.4 to the case. A total of 670 tierces and 67 one-half tierces were mild-cured (some hard-salted) by three salteries. Approximately 11,000 kings were shipped to Anchorage and Seattle markets as frozen or fresh fish by three operators.

Yukon district commercial fishermen received a total of $542,000 for their salmon and the State received approximately $42,000 in license revenues and processing taxes. The first wholesale value of the 1965 catch is estimated to be $1,412,000.

Timing and Magnitude of Runs in Lower Yukon: The Yukon River king salmon run is of short duration entering the river mostly during the month of June. The timing of the run varies from year to year probably due to differences in water temperatures and weather conditions. In recent years, the first reported catches have been made as early as May 26 in 1959 and as late as June 15 in 1964. Based on dates of upriver catches, king salmon have apparently entered the river under the ice or during breakup in some years. The greatest catches in subdistrict #1 are usually made during the third week of June. In some years a second or third peak has been noted in the commercial catch.

In 1965 breakup occurred in the lower Yukon during late May and the river was free of ice by June 1. During the 1965 season, the first reported king salmon was taken on June 6 by a Department tagging crew near Flat Island in the south mouth. The first commercial catches occurred on June 7, 8, and 9

TABLE 13

COMMERCIAL CATCHES OF KING SALMON FROM SUB-DISTRICT #1
YUKON DISTRICT, ALL GEAR COMBINED, 1965

Date of Landing	Hours Fished	Number of Fishing Boats	Total Catch	Accumulative Catch
June 7	18	26	95	95
8	24	60	221	316
9	6	76	273	589
10	6	9	22	611
11	24	152	831	1442
12	18	199	2642	4084
13	Closed			
14	18	149	3246	7330
15	24	196	5135	12465
16	6	197	6866	19331
17	3	4	132	19461
18	24	259	15435	34898
19	18	231	7810	42708
20	Closed			
21	18	200	9023	51731
22	24	250	12598	64329
23	6	222	4809	69138
24	6	34	612	69750
25	24	240	5152	74902
26	18	226	2324	77226
27	Closed			
28	18	149	1524	78750
29	24	208	2279	81029
30	6	122	2037	83066
July 1	6	23	82	83148
2	24	162	1383	84531
3	18	198	4737	89268

TABLE 14

COMMERCIAL CATCHES OF KING SALMON TAKEN FROM SUB-DISTRICT #2
YUKON DISTRICT, ALL GEAR COMBINED, 1965

Date of Landing	Hours Fished	Number of Fishing Boats	Total Catch	Accumulative Catch
June 10	18	12	34	34
11	24	27	118	152
12	6	42	109	261
13	-			
14	30	72	607	868
15	18	109	1531	2399
16	Closed			
17	18	28	663	3062
18	24	110	2231	5293
19	6	62	1537	6830
20	-			
21	30	102	3095	9925
22	18	134	4687	14612
23	Closed			
24	18	92	1835	16447
25	24	84	2210	18657
26	6	100	2028	20685
27	-			
28	30	100	1248	21933
29	18	87	927	22860
30	Closed			
July 1	18	51	329	23189
2	24	31	295	23484
3	6	12	279	23763

TABLE 15

COMMERCIAL CATCHES OF KING SALMON TAKEN FROM SUB-DISTRICT #3
YUKON DISTRICT (SET GILL NETS), 1965

Date of Landing	Hours Fished	Number of Fishing Boats	Total Catch	Accumulative Catch
June 14	6	3	14	14
15	24	10	93	107
16	24	10	82	189
17	24	6	88	277
18	18	11	459	736
19	Closed			
20	"			
21	"			
22	30	12	575	1311
23	24	8	303	1614
24	24	10	462	2076
25	18	19	1128	3204

TABLE 16

COMMERCIAL CATCHES OF KING SALMON FROM SUB-DISTRICT #4
YUKON DISTRICT, ALL GEAR COMBINED, 1965 1/

Date of Landing	Hours Fished	Number of Fishing Boats	Total Catch	Accumulative Catch
June 29	24	1	13	13
July 3	"	4	63	76
4	"	8	172	248
5	"	5	31	279
6	"	11	213	492
7	"	8	156	648
8	"	9	180	828
9	"	5	154	982
10	"	6	128	1110
11	"	5	158	1268
12	"	5	124	1392
13	"	3	52	1444
14	"	3	62	1506
15	"	2	54	1560
16	"	2	40	1600
18	"	3	27	1627
20	"	1	3	1630
22	"	1	1	1631
23	"	1	4	1635
26	"	1	3	1638
27	"	1	12	1650
Date Unknown	?	?	213	1863

1/ Reported catch represents a minimum figure - approximately 200 kings known to have been sold but not recorded on fish tickets

TABLE 17

COMMERCIAL KING SALMON CATCHES BY STATISTICAL AREA IN SUBDISTRICTS #1, #2, & #3 OF THE YUKON DISTRICT, 1965

Statistical Area	Total Catch	Catch per Boat Hour 1/
334-11	2,266	.52
12	18,140	.76
13	8,137	.76
14	6,836	.97
15	23,729	1.47
16	4,458	1.19
17	16,114	1.34
18	9,588	1.43
Subdistrict #1 Total	89,268	1.14
334-21	5,625	.77
22	8,897	.78
23	4,114	.57
24	5,127	.77
Subdistrict #2 Total	23,763	.77
334-31	2,702	1.60
32	502	1.74
Subdistrict #3 Total	3,204	1.62

1/ Based on greatest number of boats delivering in each fishing period.

in the south, middle and north mouths, respectively. The greatest catches in subdistrict #1 occurred during June 21 to June 23.

The catch per boat hour can be used as an index of the size of the run. By comparing the catch per boat by fishing period for the various statistical areas, peaks in the run can be identified and followed upriver. Figure 4 illustrates this. The exact date or dates that peaks occur cannot always be accurately assigned due to fishing closures.

Examination of the 1965 commercial fishery and tagging site catches indicate the south mouth (334-12) run peaked during June 19-21. Commercial catches indicate that the main peak occurred during June 21-23. However, a Department tagging crew, fishing seven days a week, pinpointed the actual peak which occurred during a commercial fishery closure. Based on commercial catch data, the middle mouth and north mouth runs peaked during June 17-19. A second but much smaller peak apparently occurred in early July in the south and middle mouths. This peak was not fished commercially in upriver areas due to closure of the king salmon season by field announcement.

The timing of the 1965 run was very similar to that of 1964 in that the run arrived and peaked on similar dates in all three mouths. This in in contrast to the 1963 run which entered the south mouth two days earlier than the middle mouth and five to six days earlier than the north mouth. Two peaks were noted in 1963, e.g., the south mouth peaked on or near June 12 and again on June 23.

Another interesting characteristic of the 1965 run was the apparent small magnitude of the late portion of the run. For example, catches in subdistrict #1 declined markedly after June 23 and remained low throughout the season. There

is not sufficient information to determine if this weak portion of the run represents a distinct race of king salmon.

Figure 4 also shows the peak of the run passed through subdistrict #1 and #2 in about four and three days, respectively. It can be assumed that it took about a week for king salmon to pass through the intensive commercial fishing area. This analysis also indicates that king salmon were migrating at a rate of about twenty-three miles a day.

The greatest catch for any statistical area was made in 334-15 (middle mouth) followed by 334-12 and 334-17. Catch per boat hour was also the greatest in 334-15 followed by 334-18 and 334-17. The relatively weak catches made in 334-12 and 334-13, located immediately upstream from 334-12, also indicate that the greatest number of king salmon entered the middle mouth. The middle mouth run was so heavy during June 17-19 that processors in that area could not handle the catch, and fishermen were requested to remove their gear from the river. It was reported that a majority of the middle mouth fishermen fished for only about 25 hours during this period. Peak catches made in statistical areas 334-17 and above can probably be largely attributed to this peak.

The greatest total catch and catch per boat hour has been made in the middle mouth for the past two seasons. Previously the largest catches were usually made in the south mouth (334-12). These differences in the distribution of catches probably reflect differences in migration patterns from year to year.

SMALL SALMON COMMERCIAL FISHERY, 1965

One processor purchased and froze chum and coho salmon in the vicinity of the Yukon River mouth. A total of 22,936 chum and 350 coho salmon were taken by approximately thirty fishermen from August 2 to August 4. Due to a

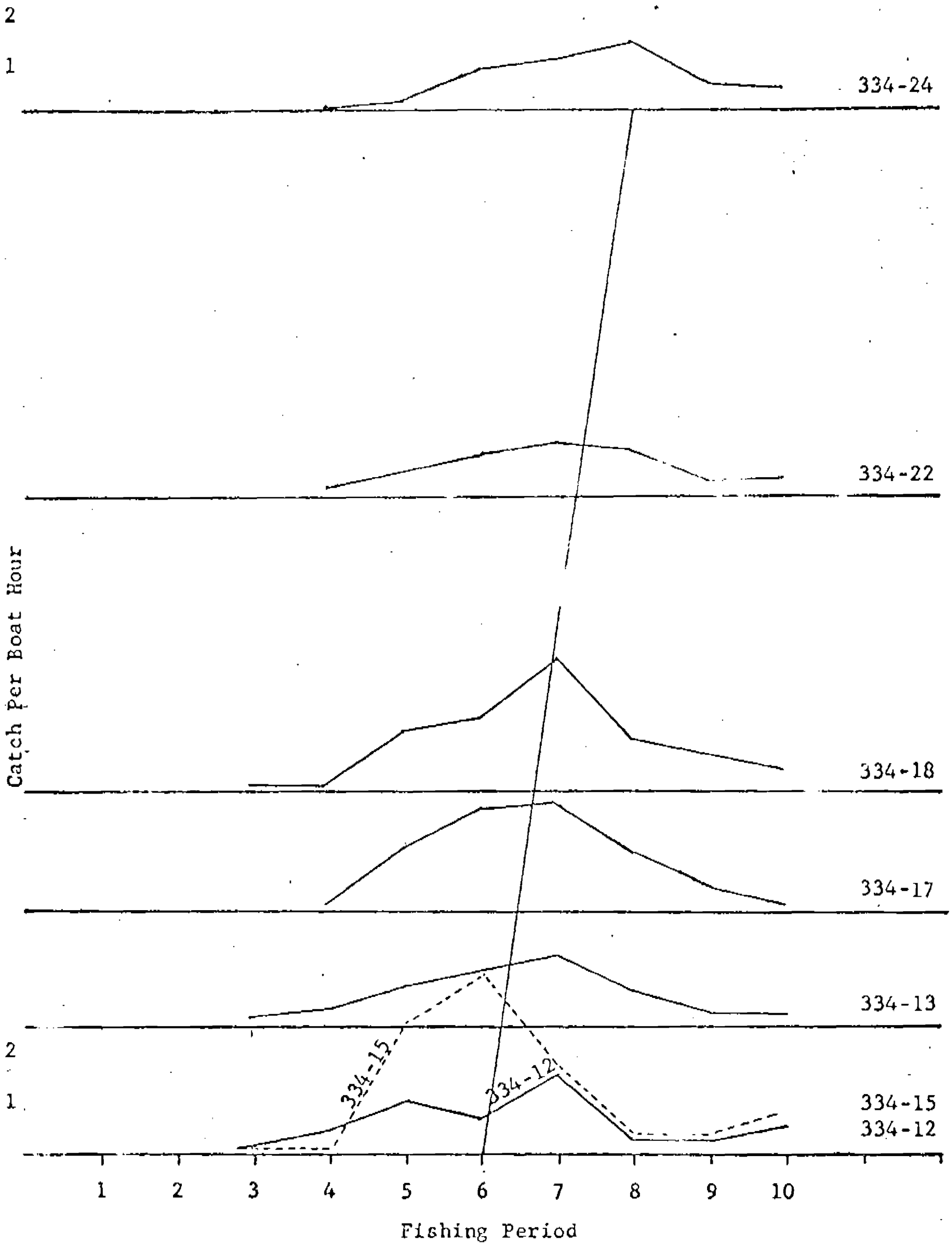


Figure 4 Catch per Boat Hour by Fishing Period in Various Statistical Areas, Yukon District, 1965

mechanical breakdown in freezing equipment, this catch could not be held in storage and a considerable portion was lost although some fish were used for subsistence.

A total of 381 chum and coho salmon were reported taken in subdistrict #4 during August. The catches of chum and coho salmon are combined because many fishermen in this area do not accurately identify these two species. The above catches are included in Table 1 (Total A-Y-K catch) but are not shown elsewhere in this report.

SUBSISTENCE FISHERY, 1965

Introduction: As in previous years, a Department of Fish and Game survey crew, traveling by boat, counted fish on drying racks and in smokehouses in every fish camp and village from the river mouth to Fort Yukon. The survey also extended up the Tanana River as far as Nenana. The survey crew traveled by chartered aircraft in order to record the catches made in Chalkytsik, Canyon Village and Venetie. In addition, catch calendars on which daily catches could be recorded were mailed to fishermen prior to the fishing season. Many fishermen completed and returned these forms to the Department. Catch calendar data recorded after the boat surveys were made are included in the total figures. Catches for Alaskan villages on the Koyukuk River, Porcupine River and above Fort Yukon were obtained from catch calendars or catch questionnaires. Finally, catches for fishing communities in Canada were obtained from records kept by the Canadian Department of Fisheries office at Whitehorse. King, pink, and summer chum catches, as in previous surveys, more nearly represent actual catches as those runs had already passed through the villages at the

times of the boat survey. The Annual Report for 1963 describes survey methods in detail.

1965 Fishery: As shown in Table 18, a total of 19,723 kings, 457,690 chums, 430 cohos, 259 pinks, totaling 478,102 salmon were recorded as being taken for subsistence purposes. A total of 614 known fishing families were surveyed and 600 units of chum gill nets (5½ inch stretched measure), 154 units of king gill net (8½ inch mesh), and 129 fishwheels were recorded as being operated. Fewer fishing families and fishwheels were recorded in 1965 than in any other year. Fishwheels have steadily declined each year, e.g., 301 fishwheels were recorded in 1920, 182 in 1961, and 155 in 1964. This emphasizes the decline in dependence upon the salmon subsistence fishery.

The total king salmon catch recorded in 1965 was very similar to the relatively small catch recorded in 1962. The chum salmon catch was the second largest ever recorded by Department surveys of the subsistence fishery.

The small 1965 king salmon catch reflects a lesser fishing effort and does not necessarily indicate a comparatively smaller run. Table 19 presents the average catches of chum and king salmon per fishing family (usually represented by head of the family) for various sections of the river for the 1961-1965 period. In order to better analyze subsistence catches, the Yukon River has been divided into seven so-called districts. These are: District I, from the mouth to just below Mt. Village; District II from Mt. Village to Holy Cross; District III from Anvik to Nulato; District IV from Koyukuk to Tanana; District V includes the Tanana River drainage; District VI from Rampart to Fort Yukon and District VII includes that portion of the Yukon drainage upstream from Fort Yukon.

TABLE 18

SUBSISTENCE CATCH (EXPANDED) BY VILLAGE
YUKON RIVER DRAINAGE, 1965

Dist.	Fishing Unit	Date of Survey	Fishing Families Surveyed	No. People in Fishing Families	Kings	Chums	Cohos	Pinks	Total Salmon	Units of Gear Chum Net	Units of Gear King Net	Units of Gear Fish-Wheels
I	Black River	1/	6	2/	7	1,029	-	4	1,040	6	0	0
	Alakanuk	8/1.8/2	54	298	177	21,464	-	9	21,650	52	6	0
	Sheldons Point	8/3	22	132	42	9,851	-	-	9,893	23	1	0
	Kwiguk-Emmonak	8/4,8/5	48	319	145	47,165	151	70	47,531	74	1	0
	Aproka Pass and Snotty Slough	8/7,8/8	28	167	281	20,121	-	8	20,410	49	4	0
	Hamilton-Kotlik	8/9	14	104	131	4,678	36	14	4,859	21	1	0
II	Mountain Village	8/16	43	284	510	11,409	37	29	11,985	45	17	0
	Pitkas Pt.-St. Marys	8/16	42	258	826	14,113	3	14	14,956	32	18	0
	Pilot Station	8/17	28	175	502	7,851	-	14	8,367	31	11	0
	Marshall	8/19	23	124	942	6,565	-	66	7,573	31	17	0
	Russian Mission	8/20	17	107	1,393	4,830	48	10	6,281	25	17	0
	Paimute-Holy Cross	8/23,8/24	27	187	2,351	25,709	-	-	28,060	16	26	7
III	Anvik	8/26	14	74	118	37,159	11	9	37,297	9	1	6
	Grayling	8/27	18	123	246	36,429	7	-	36,682	2	4	13
	Kaltag	8/29,8/30	22	157	57	29,371	-	11	29,439	7	1	5
	Nulato	8/31	23	253	305	43,987	-	1	44,293	25	3	11
IV	Koyukuk	9/1	13	79	228	11,232	-	-	11,460	19	8	3
	Galena	9/2	11	79	260	2,741	-	-	3,001	15	12	1
	Ruby	9/3	13	78	1,843	17,603	-	-	19,446	3	1	9
	Tanana	9/4,9/5	13	69	524	14,811	74	-	15,409	0	1	7
VI	Rampart	9/11	9	42	1,041	13,462	-	-	14,503	0	0	9
	Stevens Village	9/13	8	40	910	7,346	-	-	8,256	2	2	10
	Beaver	9/14	8	33	480	3,274	-	-	3,754	5	1	3
	Fort Yukon	9/15,9/16	19	133	2,747	19,399	3	-	22,149	0	0	19

TABLE 1(Cont'd)

Dist.	Fishing Unit	Date of Survey	Fishing Families Surveyed	No. People in Fishing Families	Kings	Chums	Cohos	Pinks	Total Salmon	Units of Gear Chum Net	Units of Gear King Net	Units of Gear Mesh Gill Net
VII A	Eagle	1/	1	2/	100	256	-	0	356	0	1	0
	Dawson	Canadian Dept. of	1	"	351	0	-	0	351	0	0	1
	Mayo	Fisheries	2	"	300	0	-	0	300	2	Gill Nets	0
	Stewart Crossing	"	1	"	100	0	-	0	100	1	" "	0
	Pelly River	"	3	"	300	100	-	0	400	3	" "	0
	Fort Selkirk	"	1	"	100	1,000	-	0	1,100	1	" "	0
	Minto	"	3	"	170	623	-	0	793	3	" "	0
	Carmacks	"	6	"	600	260	-	0	860	5	" "	0
	Johnson's Crossing	"	3	"	450	0	-	0	450	1	" "	0
	Tatchum Creek	"	2	"	150	0	-	0	150	1	" "	0
	Ross River	"	4	"	500	0	-	0	500	4	" "	0
	MAIN YUKON TOTALS		550		19,187	413,838	370	259	433,654	513	154	104
	Huslia	1/	4	2/	9	5,041	60	-	5,110	5	0	0
	KOYUKUK RIVER TOTALS		4		9	5,041	60	-	5,110	5	0	0
<	Manley Hot Springs and Minto	9/5,9/7	16	92	276	11,358	-	-	11,634	1	0	15
	Nenana	9/9	8	46	157	7,363	-	-	7,520	0	0	9
	TANANA RIVER TOTALS		24		433	18,721	-	-	19,154	1	0	24
	Venetie	9/20	16	91	0	9,586	-	-	9,586	26	0	1
	CHANDALAR RIVER TOTALS		16		0	9,586	-	-	9,586	26	0	1
	Canyon Village	9/17	5	28+	0	1,531	-	-	1,531	7	0	0
	Chalkytsik	9/17	15	77	0	1,438	-	-	1,438	18	0	0
	Old Crow	Can. Dept. of Fisheries	2/	200	94	7,535	-	-	7,629	30	0	0
	PORCUPINE RIVER TOTALS		20+		94	10,504	-	-	10,598	55	0	0
	YUKON DRAINAGE GRAND TOTAL		614+		19,723	457,690	430	259	478,102	600	154	129

1/ Data received from return of catch calendars
2/ Unknown

TABLE 9

MEAN SUBSISTENCE CATCHES PER FISHING FAMILY BY DISTRICT 1961-1965
(Total Catches for District VII Shown in Parenthesis)

District	King Salmon					Chum Salmon				
	1961	1962	1963	1964	1965	1961	1962	1963	1964	1965
I	5	2	9	2	5	299	219	534	251	386
II	53	22	60	27	37	304	447	239	440	392
III	6	4	14	10	9	1891	1120	1054	1682	1409
IV	58	28	63	58	57	674	856	759	1481	928
V	21	7	19	29	18	417	1035	910	1198	780
VI	66	86	106	90	118	469	451	1181	1146	1188
VII	(2751) 1/	(9593)	(7720)	(4170)	(3021)	(1867) 1/	(7400)	(5650)	(8063)	(5360)
I - VI	32	18	40	34	30	644	577	624	767	787

1/ Includes only Circle, Eagle and Dawson in 1961

These data indicate that the 1965 catches of both kings and chums compare favorably with past years. In fact, the chum salmon catch per family was the highest ever recorded since the survey was initiated in 1961. Many subsistence fishermen from the area between Mt. Village and Koyukuk were employed by Bristol Bay canneries during the summer and did not return to the Yukon until late July or early August. Thus, they missed fishing the king salmon run and, in some cases, the summer chum run. Also, the survey crew reported that some fishermen were expending little effort because they still had a supply of dried chum salmon from the previous season's catch.

Revised catch figures for Dawson during the years 1961-1965 have been released by Canadian authorities. Table 19 shows these corrected catch figures. The poor king salmon catch made in Dawson during the 1965 season was a result of the only subsistence fishermen there being ill for most of the season.

Subsistence fishing effort for Canadian communities is often based upon rough estimates and for this reason, it was not possible to compute the catch per fishing family for District VII as shown for other districts in Table 19.

DISCUSSION

Catch Comparisons: Tables 20 through 24 present comparative commercial king salmon catch and effort data by subdistrict for 1959 through 1965. During the last five seasons, the catches have ranged from 93,587 in 1964 to 120,203 in 1961. Relatively large catches have been made during 1961, 1963, and 1965 while relatively small catches have been made during 1962 and 1964.

Because of differences in fishing effort, the catch per boat hour, as shown in Table 20, more accurately reflects the relative magnitude of the runs.

TABLE 20
YUKON RIVER KING SALMON COMMERCIAL FISHERY
COMPARATIVE CATCH STATISTICS, 1959-1965

	Year	Y-1	Y-2	Y-3	Total	Y-4 1/
Catch	1959	61,018	15,934	-	76,952	1,630
	1960	50,713	15,994	-	66,707	654
	1961	84,406	29,028	4,965	118,399	1,934
	1962	67,972	22,224	4,687	93,883	724
	1963	85,004	24,211	6,976	116,191	893
	1964	67,555	20,246	4,705	92,506	1,061
	1965	89,268	23,763	3,204	116,235	31,863
Total Boat Hours	1959	36,954 (1.7)	27,414 (0.6)	-	64,368 (1.2)	
(Catch per Boat Hr.)	1960	40,648 (1.2)	34,914 (0.5)	-	75,762 (0.9)	
	1961	79,224 (1.1)	29,113 (1.0)	2,808 (1.8)	111,159 (1.1)	
	1962	84,792 (0.8)	38,118 (0.6)	2,520 (1.9)	125,430 (0.8)	
	1963	72,268 (1.2)	27,672 (0.9)	5,616 (1.2)	105,576 (1.1)	
	1964	56,736 (1.2)	22,398 (0.9)	4,596 (1.0)	83,730 (1.1)	
	1965	78,096 (1.1)	31,008 (0.8)	2,286 (1.6)	111,390 (1.0)	
Licenses Issued	1960	186	33	-	219 (?)	10
Vessel (Tenders)	1961	210	112	18	340 (18)	10
	1962	320	127	31	478 (23)	12
	1963	272	113	22	407 (22)	6
	1964	314	101	24	439 (17)	12
	1965	322	111	26	459 (27)	27
Drift Gill Nets	1960	2 (100)	44 (2,631)	-	2,731	0
(Number Fathoms)	1961	17 (925)	86 (5,130)	-	6,055	0
	1962	55 (3200)	98 (6,750)	24 (1,730)	11,680	0
	1963	24 (1225)	85 (6,585)	5 (400)	8,210	0
	1964	65 (3835)	89 (5,390)	5 (225)	9,450	0
	1965	62 (3615)	98 (6,050)	4 (250)	9,915	0
Set Gill Nets	1960	183 (21,750)	59 (3,324)	-	(25,074)	2 (100)
(Number Fathoms)	1961	217 (25,560)	101 (6,050)	19 (691)	(32,301)	1 (50)
	1962	303 (35,470)	117 (6,465)	14 (900)	(42,835)	2 (100)
	1963	259 (30,975)	101 (5,445)	21 (1,350)	(37,770)	2 (90)
	1964	277 (32,090)	100 (5,105)	28 (2,080)	(39,275)	4 (235)
	1965	292 (32,980)	98 (5,410)	23 (1,460)	(39,870)	7 (350)

1/ Effort data is not considered accurate for analysis. Also five (5) fishwheels were operated in 1965.

TABLE 21

KING SALMON CATCH PER BOAT HOUR AND MAXIMUM NUMBER OF BOATS BY FISHING PERIOD FOR SUBDISTRICT #1, YUKON DISTRICT, DURING 1961-1965 1/

YEAR	J 3	4	5	6	7	8	9	10	U 11	12	13	14	15	16	17	18	N 19	20	21	22	23	E 24	25	26	27	28	29	30	J 1	U 2	L 3	Y 4	5	6	7	8
1961			.3 / 124						2.4 / 186								1.1 / 186							.7 / 181							.4 / 156					
1962									.6 / 147								.9 / 230				1.2 / 222										.3 / 201					
1963	.3 / 56		.5 / 162				1.4 / 186		1.6 / 219				1.7 / 203				.6 / 219				1.9 / 172			1.1 / 201				.5 / 80							
1964												.1 / 40		1.0 / 186			2.8 / 204				1.1 / 226			.8 / 180				1.1 / 198		.3 / 148					
1965				.2 / 76		.4 / 199			1.6 / 197			1.9 / 259			2.2 / 250			.7 / 240				.6 / 208			.7 / 198										

1/ Fishing periods consisted of 96 hours and 48 hours (actual hours fished) for 1961-1962 and 1963-1965, respectively, except as follows:

1961: Period 6/5-8, 90 hours
1962: Period 6/22-28, 132 hours

TABLE 22

KING SALMON CATCH PER BOAT HOUR AND MAXIMUM NUMBER OF BOATS BY FISHING PERIOD
FOR SUBDISTRICT #2, YUKON DISTRICT, DURING 1961-1965 1/

YEAR	J 7	8	9	10	11	U 12	13	14	15	16	17	N 18	19	20	21	22	E 23	24	25	26	27	28	29	30	J 1	2	U 3	4	L 5	Y 6	7
1961	.1 / 63							.9 / 111							1.6 / 102							1.0 / 55									
1962									.3 / 93						.8 / 101						.3 / 106								.2 / 75		
1963	.3 / 12		.3 / 86			.7 / 47			1.1 / 126			1.0 / 61			1.1 / 110			1.1 / 34			.8 / 55										
1964										.4 / 33			.8 / 106			1.9 / 74			1.0 / 106			.6 / 78			.5 / 82					
1965			.1 / 42		.4 / 109			.8 / 110			1.2 / 134			1.3 / 100			.9 / 100			.4 / 51										

1/ Fishing periods consisted of 96 hours and 48 hours (actual hours fished) for 1961-1962 and 1963-1965, respectively, except as follows:

1961: Period 6/7-10, 90 hours
1962: Period 6/25-30, 120 hours
1963: Period 6/7-8, 30 hours
1964: Period 6/19-20, 30 hours

TABLE 23

CUMULATIVE CATCHES AND CUMULATIVE BOAT HOURS (in parenthesis) BY DATE FOR SUBDISTRICT #1
YUKON DISTRICT, 1959-1965 1/
IN THOUSANDS

Date of Land.	1959	1960	1961	1962	1963	1964	1965
6/1	.03	.01					
2	.2	.1					
3	.3	.2			.02		
4	.5(4.5)	.3 (2.3)			.2		
5	1.5		.2		.7 (2.7)		
6	2.3 (8.9)	.4	.6		.7		.1
7		1.0	1.8		2.2		.3
8	3.7	1.8 (8.1)	3.6 (11.2)		4.7 (10.5)		.6 (3.6)
9	7.4	4.3					.6
10	11.6	6.7			7.2		1.4
11	15.3	9.8 (17.4)	4.9	1.1	11.6		4.1 (13.2)
12	17.6		14.1	3.4	16.9 (19.4)		
13	28.8 (25.7)	12.6	26.1	4.7	17.3		7.3
14		19.0	34.2	8.0 (14.1)	22.3		12.5
15	31.1	26.1	46.6 (29.0)		33.4 (30.0)	.04	19.3 (22.7)
16	37.7	34.2				.1	19.5
17	42.6	41.1		8.1	41.0	.2 (1.9)	34.9
18	57.6	44.1 (37.5)	48.3	12.5	46.6		42.7 (35.1)
19	61.0 (37.0)		55.6	15.7	50.3 (39.7)	4.1	
20		48.0	58.5	18.8	50.4	9.5 (10.8)	

TABLE 23

CUMULATIVE CATCHES AND CUMULATIVE BOAT HOURS (in parenthesis) BY DATE FOR SUBDISTRICT #1
YUKON DISTRICT, 1959-1965 (Cont) 1/
IN THOUSANDS

Date of Land.	1959	1960	1961	1962	1963	1964	1965
6/21		51.0 (40.9)	62.4	27.5 (36.2)	53.7		61.7
22			66.6 (46.9)	28.5	56.8 (50.2)	17.9	64.3
23				37.2		30.2	69.1 (47.1)
24				41.9	64.2	37.0 (20.6)	69.8
25			66.7	49.4	70.0	37.3	74.9
26			70.2	54.6	72.2 (58.4)	43.0	77.2 (53.6)
27			74.7	59.0	73.3	48.5 (31.5)	
28			77.0	62.3 (65.5)	78.5		78.8
29			79.0 (64.2)		83.1 (68.1)	50.4	81.0 (63.6)
30						53.3	83.1
7/ 1				62.5	84.2	55.3 (40.1)	83.1
2			79.2	64.2	84.5	55.6	84.5
3			81.4	65.1	85.9 (72.3)	59.7	89.3 (78.1)
4			83.1	66.1		65.3 (49.6)	
5			83.7	67.1 (84.8)			
6			84.4 (79.2)			66.0	
7						67.0	
8						67.6 (56.7)	
Days Fished	14.9	15.8	19.8	17.5	18.0	14.0	16.0
Total Boat Hrs.	36,954	40,848	79,224	84,792	72,288	56,736	78,096
Catch/Boat Hr.	1.7	1.2	1.1	.8	1.2	1.2	1.1

1/ Based on highest number of boats delivering in each period

TABLE 24

CUMULATIVE CATCHES AND CUMULATIVE BOAT HOURS (in parenthesis) BY DATE FOR SUBDISTRICT #2 1/
YUKON DISTRICT, 1959-1965 1/
IN THOUSANDS

Date of Land.	1959	1960	1961	1962	1963	1964	1965
6/1							
2	.009						
3	.04 (.4)	.003					
4	.09	.02 (.5)					
5	.2						
6	.3 (2.9)	.03					
7		.2	.005				
8	.5	.3	.1		.1 (.4)		
9	.9	.4	.3				
10	1.5	.7	.6 (5.7)		.4		.03
11	1.8	1.1 (8.6)			1.5 (4.5)		.2
12	2.2		.7				.3 (2.0)
13	2.7 (15.2)	1.6	1.1	.2	1.7		
14		2.2	3.5	.7	3.3		.9
15	4.3	2.5	5.9	1.4	4.6 (9.1)		2.4 (7.2)
16	7.2	2.8	7.6	2.2 (8.4)	4.7		
17	10.0	13.1 (24.3)	10.4 (16.3)		6.4		3.1
18	13.8	13.4 (20.0)	10.5		11.3 (15.2)		5.3
19	16.0 (27.4)	[illegible]	12.2	2.4		.06	6.8 (12.5)
20		14.1	12.9	5.3	12.2	.4 (1.0)	.

TABLE 24 (cont.)

CUMULATIVE CATCHES AND CUMULATIVE BOAT HOURS (in parenthesis) BY DATE FOR SUBDISTRICT #2
YUKON DISTRICT, 1959-1965 (Cont) 1/
IN THOUSANDS

Date of Land	1959	1960	1961	1962	1963	1964	1965
6/21		5.0	19.4	6.8	13.3		10.0
22		6.0	22.8	8.6	14.3 (18.1)	1.2	14.6 (19.8)
23		8.0	25.1	10.1 (18.1)	14.6	4.4 (6.1)	
24		12.6	26.1 (26.1)		15.5		16.5
25		16.0 (34.9)		10.2	20.2 (23.4)	5.8	18.7
26				12.1		8.7	20.7 (23.8)
27				15.9	21.1	11.1 (9.6)	
28			28.0	17.6	21.5	11.8	21.9
29			28.5	19.3	22.0 (25.0)	13.4	22.9 (28.6)
30			28.8	20.7 (30.8)	22.4	16.1 (14.7)	
7/ 1			29.0 (29.2)		23.2		23.2
2					24.2 (27.7)	16.6	23.5
3				20.8		17.8	23.8 (31-0)
4				21.7		18.5 (18.5)	
5				22.1			
6				22.2 (38.1)		19.6	
7						20.2 (22.4)	
8							
Days Fished	15.0	18.3	15.8	16.8	14.3	11.3	14.0
Total Boat Hrs.	27,414	34,914	29,118	38,118	27,672	22,398	31,008
Catch/Boat Hr.	.6	.5	1.0	.6	.9	.9	.8

1/ Boat Hours based on greatest number of boats delivering in one period

Using this comparison, all king salmon runs during the past five seasons, with the exception of 1962, have been of similar magnitudes. It is suspected that the 1962 run was larger than indicated due to an influx of inexperienced fishermen and poor fishing conditions (driftwood and high water).

Based on commercial catches made during early August in subdistrict #1 and Yukon drainage subsistence catches, a large chum salmon run occurred in 1965. Due to lack of fishing effort, there is insufficient catch data to indicate the relative magnitude of the coho salmon run.

Escapement Indices: Total escapements are impossible to determine for the Yukon River drainage due to the turbid water conditions and remoteness of many of the spawning tributaries. Aerial survey data of "key" streams and catch per unit effort data (commercial and subsistence) are used as indices of total escapements.

Due to poor stream and weather conditions encountered during the 1965 season, Yukon River tributaries could not be adequately surveyed. However, there are a number of other indicators that suggest the 1965 king salmon escapement was at least "fair":

1. A second, although relatively small peak, occurred in the south and middle mouths and was not fished commercially in upriver areas.
2. The king salmon season in subdistrict #3 was closed when the run had just begun to peak. Catches in this area, located upstream from the major commercial fishing grounds, were relatively good.
3. Canadian authorities reported "light to medium" runs. The king salmon count at Whitehorse Dam was 903 which can be considered an average or

a better than average run, when compared to counts obtained during the past seven seasons.

4. Subsistence catches of kings in upriver areas indicate "fair" to "good" escapements when compared to catches made during the preceding four seasons.

Fishing Effort: At the present time there are more Yukon District commercial fishermen than required to make maximum harvest of the king salmon runs. For example, in 1961 a total of 210 registered subdistrict #1 fishermen harvested 84,406 king salmon for a seasonal average of 400 fish per fishermen. This season a total of 322 registered subdistrict #1 fishermen harvested 89,268 king salmon for a seasonal average of only 240 fish per fisherman. Thus even though the total catch was greater in 1965, the return to the individual was only about one-half that of 1961.

Fishing effort, based on license sales, has increased 40 percent in the last five years and 100 percent in the last six years. The numbers of licenses issued in 1965 increased over that of 1964, thus the trend of a gradual increase in fishing effort has occurred each year since 1963.

As mentioned previously the quota system of management was replaced in 1961 with the present system of permitting commercial fishing for four days a week throughout the run. It is believed that optimum catches have been made during the past five seasons and catch increases are not warranted. The catch must be stabilized for the next few seasons until the effects of this increased catch can be fully evaluated. Six-year-old king salmon are the greatest contributors to the commercial fishery and most of the progeny of the 1961 escapement will not return until 1967.

In order to stabilize catches and provide for adequate escapements, a number of alternatives exist: 1) reduction of fishing time, 2) gear is made less efficient, 3) certain areas can be closed to commercial fishing. It is anticipated that one or more of these steps will be initiated in the near future.

Japanese High Seas Fisheries: The future of the Yukon king salmon fishery is further complicated by Japan's fishing activities on the high seas. In 1964 the Japanese mothership fleet took an all-time high total of 410,000 king salmon, believed to be mostly immature four-year olds. Over 50 percent of the mothership catch was made in Bering Sea waters. Although good information regarding the origin and distribution of king salmon on the high seas is not available, there is every reason to expect a smaller than normal return of six-year-old kings to Western and Northwestern Alaska streams during the 1966 season.

Incidental Catch of Chum Salmon: Present regulations prohibit the sale of chum salmon in the Yukon district until after August 1. Chums taken incidentally with king salmon gear during the commercial king salmon season must be utilized for subsistence.

An estimate of the 1965 subdistrict #1 catch can be made by comparing Flat Island tagging site catches to commercial king salmon catches. King salmon nets (8½ inch) operated by Department tagging crews during the commercial king salmon season captured a total of 799 kings and 589 chums. Applying this catch ratio (1 chum: 1.36 kings) to the commercial king salmon catch indicates a catch of about 65,000 chums. Another estimate can be made by utilizing other subdistrict #1 catch data. A total of 1,398 kings and 1,169 chums were

recorded as taken by four Flat Island commercial fishermen. Applying this ratio (1 chum:1.20 kings) to the commercial catch indicates a catch of about 74,000 chums.

Comparisons of tagging site and commercial fishery data indicated an incidental catch in subdistrict #1 of about 63,000 chums during the 1964 king salmon season. Estimates for other subdistricts cannot be made due to lack of reliable data.

Studies regarding estimates of the incidental chum salmon catch and utilization of this catch will be expanded next season. Based on information, resulting from these studies, it may be feasible to permit sale of incidentally caught chum salmon. However, before present restrictions can be relaxed, the following must be accurately determined:

1. To what extent are incidentally caught chums being utilized at the present time?
2. Can the incidental chum catch be held to its present level if the restrictions regarding sale are removed?

SECTION II

SPECIAL STUDIES

AGE, SEX AND SIZE COMPOSITIONS OF SALMON RUNS

1 9 6 5

INTRODUCTION

The catch sampling program initiated in 1964 was continued in 1965. The objectives of this program are to provide such basic management information as age, length, weight, and sexual composition of the various salmon runs. This information is needed for run predictions and in assessing the effects of a fishery upon run productivity.

METHODS

Sampling procedures were identical to those used in 1964. Scale samples were taken from the area of the first or second scale row above the lateral line and located on a diagonal line down from the insertion of the dorsal fin. For purposes of this report, a 4_2 salmon is defined as having spent one winter in fresh water (one annulus), two winters in the ocean (two annuli) and is entering its fourth year of life (total of three annuli). For example, a 4_2 salmon returning to spawn in 1965 would be the progeny of the 1961 run that migrated from fresh water to the ocean in the spring of 1963. Chum salmon do not over-winter in fresh water and so only their total ages are given. All lengths presented in the following tables were taken from the mid-orbit of the eye to the fork of the caudal fin (orbit length). Sex was determined by examining the gonads of each fish sampled. The occurrence of predator and lamprey markings was noted as was the relative stage of sexual maturity of each fish sampled.

KUSKOKWIM DISTRICT COHO SALMON

Age and Sex Composition: Because of sporadic fishing effort, due to adverse weather conditions, a limited sample size of 60 fish was obtained. The age composition of the sample consisted of all 4_3 age class fish with a sex ratio of 46.7 percent males:53.3 percent females.

Length and Weight Composition: Table 43 gives lengths and weights of the sample by sex and combined sexes. Males exhibited greater lengths and weights than did females, for the one age class present.

Predator-Lamprey Marking and Relative Maturity: As was observed in the examination for predator-lamprey markings of the other salmon species sampled in this project, evidence of lamprey marking occurred most often; of this sample, 23 percent bore lamprey scars. Only one fish in the sample exhibited advanced relative maturity.

YUKON DISTRICT KING SALMON

Introduction: A total of 643 king salmon, captured with gill nets of varying mesh sizes, were sampled for age, sex and size composition. The following samples are discussed in this section: 46 king salmon taken with 7 inch stretched mesh and 584 kings taken with 8½ inch stretched mesh. Only 13 kings were taken with 10 inch mesh nets and, due to the small size of the sample, are not discussed here. Most of the 8½ inch mesh sample was taken by commercial fishermen from June 8 to July 3 near Flat Island in the south mouth. The remaining samples were taken with Department tagging gear that was operated near Flat Island.

TABLE 43

AGE, SEX, LENGTHS & WEIGHTS OF SIXTY (60) COMMERCIALLY CAUGHT COHO SALMON
KUSKOKWIM DISTRICT, AUGUST, 1965

Sex Number (%)	Age	Mean Orbit Length in Cm.	Mean Weight in Pounds
Males 28(46.7)	4_3	54.96	6.87
Females 60 (100)	4_3	53.01	6.15

Average Weight of Sample Sexes Combined	6.50 pounds
Average Length of Sample Sexes Combined	53.93 cm.

8½ Inch Mesh Gill Net Sample: This sample contained seven age classes as shown in Table 44. The 6_2 age group represented 55.5% of the sample with 5_2, 7_2, and 7_3 age groups following in order of relative abundance. The three remaining age groups, 4_2, 6_3, and 8_3, were represented by only a few specimens.

The sample contained 56 percent males and 43 percent females. There were no 4_2 females in the sample. Males dominated the 5_2 group (90 males:21 females) while the older age groups were composed of a near equal sex-ratio (232 males: 235 females).

For purposes of observing trends in age and sex composition during the season, the sample was divided into three sampling periods as follows: June 8-15 (n=164), June 17-26 (n=317), and June 30-July 3 (n=103). These samples were taken during the early, mid (peak), and late segments of the south mouth run. The relative abundance of 4_2 and 5_2 kings increased while that of 6_2 kings decreased slightly with each successive sampling period. Males outnumbered females in both the early and late samples. Males were especially abundant in the late sample (83% males:17% females) and were dominant in all age groups. Females were more abundant in the mid-season sample (46% males:54% females) due to the large numbers of females in the 6_2 age class (64 males:108 females).

Table 45 presents the mean orbit lengths and mean weights by sex for each age class. Males were larger than females in all age groups except 5_2 and 6_3. The mean weight of the entire sample, ages and sexes combined, was 23.0 pounds. The mean weights for males and females were 22.8 and 23.2 pounds, respectively.

Comparison of 7 Inch and 8½ Inch Mesh Samples: A total of 46 kings, captured with 7 inch stretched mesh nets during June 20-21, were sampled. Table

TABLE 44

AGE COMPOSITION OF YUKON DISTRICT KING SALMON
CAPTURED WITH 8½ INCH STRETCHED MESH GILL NETS
DURING JUNE 8-JULY 3, 1965

Age Class	MALES Number	MALES Percentage	FEMALES Number	FEMALES Percentage	COMBINED SEXES Number	COMBINED SEXES Percentage
4_2	6	1.0	0	0	6	1.0
5_2	90	15.4	21	3.6	111	19.0
6_2	161	27.6	163	27.9	324	55.5
6_3	1	.2	2	.3	3	.5
7_2	42	7.2	35	6.0	77	13.2
7_3	27	4.6	33	5.7	60	10.3
8_3	1	.2	2	.3	3	.5
Combined Ages	328	56.2	256	43.8	584	100.0

TABLE 45

LENGTHS AND WEIGHTS OF YUKON DISTRICT KING SALMON
CAPTURED WITH 8½ INCH STRETCHED MESH GILL NETS
DURING JUNE 8-JULY 3, 1965

Mean Orbit Lengths in Centimeters

Age Class	M A L E S		F E M A L E S		COMBINED SEXES	
	Number	Mean Length	Number	Mean Length	Number	Mean Length
4_2	6	51.9	0	-	6	51.9
5_2	90	72.4	21	74.8	111	72.9
6_2	161	85.4	163	84.4	324	84.9
6_3	1	70.5	2	78.5	3	75.8
7_2	42	96.0	35	91.2	77	93.9
7_3	27	86.5	33	81.3	60	83.6
8_3	1	86.0	2	91.3	3	89.5
Combined Ages	328	82.4	256	84.2	584	83.2

Mean Weight in Pounds

Age Class	M A L E S		F E M A L E S		COMBINED SEXES	
	Number	Mean Weight	Number	Mean Weight	Number	Mean Weight
4_2	6	5.3	0	-	6	5.3
5_2	90	14.5	21	16.8	111	14.9
6_2	161	24.3	163	23.1	324	23.7
6_3	1	13.0	2	18.8	3	16.8
7_2	42	36.2	35	29.8	77	33.3
7_3	27	25.2	33	21.2	60	23.0
8_3	1	37.5	2	1/	3	1/
Combined Ages	328	22.8	256	23.2	584	23.0

1/ Some weights missing

46 compares the age and sex composition of this sample to a 8½ inch mesh sample taken during the same time. This comparison shows a greater percentage of the 5_2 age class in the 7 inch mesh sample and greater percentages of the 7_2 and 7_3 age groups in the 8½ inch mesh sample.

Comparison with Previous Studies: In this section only samples taken with 8½ inch mesh nets during 1964 and 1965 will be compared. The 1965 sample (n=584) differed from the 1964 sample (n=487) as it contained greater percentages of 7_3 kings (10.3% vs. 5.7%) and 5_2 kings (19.0% vs. 14.8%) but a smaller percentage of 4_2 kings (1.0% vs. 7.2%). The percentage compositions of the other age groups were very similar for both samples. The 6_2 age groups were dominant in both samples, 57.1 percent in 1964 and 55.5 percent in 1965. The two samples had almost identical sex ratios, 57 percent males in 1964 and 56 percent in 1965.

Similar to the 1965 sample, the 1964 sample was divided into three sampling periods in order to note seasonal trend in age and sex composition. The only common trend in age composition was an increase in the 4_2 age group as the season progressed. Also, one sampling period during each year was found to contain an unusually high proportion of males. For example, the June 24-30 sample in 1964 contained 62% males and the June 30-July 3 sample in 1965 contained 83% males.

In the future, sampling should be conducted more often in order to better determine trends in age and sex composition during the season. This information is expected to have important management implications regarding regulating the quality of the escapements.

TABLE 46

AGE COMPOSITION OF YUKON DISTRICT KING SALMON CAPTURED WITH GILL NETS OF VARYING MESH SIZES DURING JUNE 20-21, 1965

7 Inch Mesh Sample

Age Class	MALES Number	MALES Percentage	FEMALES Number	FEMALES Percentage	COMBINED SEXES Number	COMBINED SEXES Percentage
5_2	11	23.9	4	8.7	15	32.6
6_2	11	23.9	16	34.8	27	58.7
7_2	0	-	0	-	0	-
7_3	1	2.2	2	4.3	3	6.5
8_3	1	2.2	0	-	1	2.2
Combined Ages	24	52.2	22	47.8	46	100.0

8½ Inch Mesh Sample

Age Class	MALES Number	MALES Percentage	FEMALES Number	FEMALES Percentage	COMBINED SEXES Number	COMBINED SEXES Percentage
5_2	15	17.1	4	4.5	19	21.6
6_2	18	20.4	31	35.2	49	55.6
7_2	8	9.1	5	5.7	13	14.8
7_3	2	2.3	5	5.7	7	8.0
8_3	0	-	0	-	0	-
Combined Ages	43	48.9	45	51.1	88	100.0

YUKON DISTRICT CHUM SALMON

Table 47 presents the age, sex and size composition of 486 chum salmon sampled from gill net catches made in the Flat Island area. Of the total sample, 206 chums were captured in 5½ inch mesh nets, 85 in 7½ inch mesh nets, 113 in 8½ inch mesh nets, 28 in 10 inch mesh nets and 54 in nets of unknown mesh size. The sample consisted of 97.3 percent four-year olds, 2.5 percent five-year olds and 0.2 percent three-year olds. Irregardless of the type of gill net used, the age compositions of all sub-samples were very similar.

The sex ratio of the total sample favored males 57.6 percent to 42.4 percent for females. It is difficult to interpret differences in sex ratios of the various sub-samples since they were not all collected during the same period of time. The 5½ inch net sub-sample exhibited a near equal sex ratio, while males were dominant in the other sub-samples that were captured with larger mesh gill nets.

Comparisons with Previous Studies: Samples of Yukon River chum salmon have been obtained since 1961 for the purpose of determining age, sex, and size compositions. The 1965 sample differed from those of previous years by its greater percentage of four-year olds and smaller percentages of three- and five-year olds.

Use of Age Composition Studies in Run Predictions: The 1964 sample contained an unusually large proportion of three-year olds (33%). It was speculated that this may indicate good survival of 1961 brood-year chum salmon which would result in a large 1965 run consisting of mostly four-year olds. Since the 1965 run exhibited the above characteristics, there may be a relationship

TABLE 47

AGES, LENGTHS AND WEIGHTS OF YUKON RIVER
CHUM SALMON SAMPLED DURING JUNE 12-27, 1965

Age Composition

Sex	Number	Percent	Age 3 Percent	Age 4 Percent	Age 5 Percent
Male	280	57.6	--	55.6	2.1
Female	206	42.4	.2	41.7	.4
Combined Sexes	486	100.00	.2	97.3	2.5

Mean Orbit Lengths in Centimeters

Age Class	Males		Females	
	Number	Mean Length	Number	Mean Length
3	-	-	1	51.5
4	270	58.4	203	55.2
5	10	62.6	2	60.0

Mean Weight in Pounds

Age Class	Males		Females	
	Number	Mean Weight	Number	Mean Weight
3	-		1	4.5
4	270	7.2	203	5.7
5	10	8.9	2	8.0
Combined Ages	280	7.3	206	5.7

Average weight of sample - 6.6 pounds

between the occurrence of three-year olds in one year and the size of the run during the following year. Using available data it appears that a similar large run will not occur in 1966 and may be composed of a greater-than-normal percentage of 1961 brood-year chum salmon returning as five-year olds.

NORTON SOUND DISTRICT CHUM AND PINK SALMON

Introduction: Catch sampling in 1965 was limited to samples collected from the Kwiniuk River subsistence fishery at Moses Point (in subdistrict Z-3). Although the samples were taken from only one river system, it may be assumed that Kwiniuk River chum and pink salmon are representative of other Norton Sound populations in regard to age and sex composition, mean lengths and weights. A total of 568 chums and 23 pinks samples were collected from the subsistence fishery. All samples taken during the period June 24-28 were from the set net fishery (mostly 5½ inch mesh stretched measure) near the mouth of the Kwiniuk River. The remaining samples were collected from beach seine caught fish taken above the counting tower site. The subsistence catch above the tower consisted of 6,227 chums, 367 pinks, and 5 kings.

Chum Salmon: Age and sex composition data has been grouped into three sampling periods: June 24-28, July 2-3, and July 12. Results are presented in Table 48. There appears to be no clearly defined trends of change in sex ratio or age composition in successive samples. In the entire sample (combined sexes) there was a greater proportion of males (52.3%) than females (47.7%). The percentage age composition of the combined sexes was as follows: three-year olds (0.8%), four-year olds (89.8%), five-year olds (9.0%), and six-year olds (0.4%).

From: 1965 A... ...

SALMON FECUNDITY STUDIES

by Mike Geiger

INTRODUCTION

In 1965 the collection of ovary samples to determine fecundity was greatly expanded over previous years. Ovaries were taken from Yukon River subsistence chum and commercial king salmon catches at Flat Island. In addition, pinks and chums were sampled from the subsistence fishery at Moses Point on the Kwiniuk River.

The primary objectives of the fecundity sampling program were to 1) determine the average number of eggs by species in each river system in relation to age at maturity, length, and weight; and 2) to compare fecundity with that of other areas. Fecundity sampling can also provide an estimate of potential production, if the number of female spawners is known, and subsequently an indication of freshwater mortality. From the management point-of-view it would be desirable to allow the larger, more productive, females to spawn if the relationship between fecundity and length can be determined. In other studies fecundity levels have been used in an attempt to separate different races within a main river system and to distinguish between different populations in other river systems.

Below are presented results and a discussion of the fecundity data according to species. Reference will be made to previous investigations for comparative purposes when appropriate.

METHODS AND MATERIALS

Fecundity samples were collected periodically throughout the king and chum runs. All pink samples were taken on the same day, July 12, at the peak of the run. Measurements of weight, orbit and fork lengths were taken and scale samples were collected for age determinations. Fork lengths were recorded so that comparisons can be made with previous investigations. Each sample was preserved in a 10 per cent formalin solution. Prior to placing the sample in the preservative, each ovary was wrapped in cheesecloth and submerged in near boiling water to loosen the eggs from the fibrous membranes and to insure that all eggs were water hardened. Although this method was time-consuming, it guaranteed that all eggs would be preserved when placed in the formalin solution. Actual counts of the number of eggs per sample were tabulated with hand tally counters.

RESULTS

King Salmon: A total of 25 Yukon River kings were sampled for fecundity. Results are presented in Table55. The average number of eggs per female for combined age groups was 7,587 with a range of 4,645 to 12,203. It was not possible to compare fecundity by age class since too few samples were taken of age 5_2, 7_2, and 7_3 fish. The dominant age class, 6_2 fish, consisted of 15 samples averaging 6,623 eggs per female. Age determinations could not be assigned to four of the fish sampled.

TABLE 55

FECUNDITY OF YUKON RIVER KING AND CHUM SALMON, 1965

Sampled at Flat, Yukon

Species	Age	Number in Sample	Mean Weight (pounds)	Mean Fork Length (cm.)	Mean Orbit Length (cm.)	Number of Eggs		
						Mean	Minimum	Maximum
King	5_2	1	21.0	92.5	86.5	9,639	-	-
	6_2	15	23.1	91.2	85.4	7,733	4,645	12,203
	7_2	4	28.1	95.0	88.1	6,623	5,694	8,702
	7_3	1	16.0	80.5	75.5	5,821	-	-
	?	4	25.4	93.3	87.3	7,930	7,359	8,970
	TOTAL	25	23.9	91.8	85.8	7,587	4,645	12,203
Chum	4	28	5.77	58.8	55.0	2,338	1,516	3,819
	5	1	9.00	67.0	63.0	2,767	-	-
	?	2	5.50	58.5	54.6	1,892	1,859	1,925
	TOTAL	31	5.85	59.0	55.2	2,323	1,516	3,819

Chum Salmon: A total of 31 Yukon River and 25 Kwiniuk River chums were sampled for fecundity. Results are presented in Tables 55 and 56. The average fecundity for Yukon River chums was 2,323 eggs with a minimum of 1,516 and a maximum of 3,819, while Kwiniuk River fish averaged 2,981 eggs with a range of 1,786 to 4,041. Kwiniuk River chums averaged approximately 660 eggs more than Yukon River fish. Variations in fecundity between age classes were noted only for the Kwiniuk River chums since only one 5-year-old was sampled from the Yukon River. The 4-year-old Kwiniuk River chums contained an average of 3,027 eggs while the 5-year-old fish averaged 2,838 eggs.

Pink Salmon: The average fecundity of Kwiniuk River pinks, as determined from 17 samples, was 1,372 eggs with a minimum of 938 and a maximum of 1,573. Data is presented in Table 56.

DISCUSSION

It has been demonstrated that a linear relationship exists between body size and fecundity for salmon. This relationship is usually more pronounced when length is used rather than weight. Since fecundity has been shown to be a function of size and growth is greatly influenced by the amount of time spent in the ocean, the average number of eggs per female would be expected to differ between age groups. Moreover, it has been shown that there are variations in fecundity between races of the same species between different river systems after taking into account differences in the size of

TABLE 56

FECUNDITY OF KWINIUK RIVER CHUM AND PINK SALMON, 1965

Species	Age	Number in Sample	Mean Weight (pounds)	Mean Fork Length (cm.)	Mean Orbit Length (cm.)	Number of Eggs		
						Mean	Minimum	Maximum
Chum	4	19	6.33	61.2	56.5	3,027	1,786	4,041
	5	6	6.58	61.2	58.4	2,838	2,156	3,712
	TOTAL	25	6.39	61.2	57.0	2,981	1,786	4,041
Pink	2	17	2.32	44.9	41.9	1,372	938	1,573

the fish (Rounsefell, 1957). The above mentioned factors dealing with variation in fecundity will be descussed below.

King Salmon: As very few samples of the age groups, other than age 6_2 fish, were collected it was not possible to compare fecundity between age groups for Yukon River fish. In other areas different levels of fecundity between age groups has been demonstrated for king salmon, e.g. the Columbia River (Galbreath and Ridenhour, 1964) and Cook Inlet (Yancey and Thorsteinson, 1963).

It has been suggested by Rounsefell (1957) that there is an indication of lower fecundity in salmon, except pinks, from south to north. The decrease in fecundity may be attributed to a higher age at maturity as a result of lower growth rates. According to this assumption Yukon River king salmon would be expected to exhibit a comparatively lower fecundity as this population represents the northern end of the range. However, when the average and relative fecundity (ratio of number of eggs to average length) are compared to other area populations, the Yukon River kings exhibit a high level of fecundity. For example, the average and relative fecundity of Yukon River kings (7,587 eggs; 82.6 eggs per cm) is greater than Columbia River kings (5,090; 60.2) but less than Cook Inlet fish (8,517; 107.0).

Chum Salmon: Several interesting features are noted in regard to the fecundity of chum salmon of the Yukon and Kwiniuk Rivers. In the Yukon River there are two distinct races of chum salmon, the summer and autumn runs. In studies of the chum salmon of the

Amur River in Siberia, where both runs occur, the following differences have been noted: 1) autumn chums enter the river later and its sexual products are not as fully developed, 2) the autumn run travels farther upstream and spawns later and, 3) it is of larger size and its fecundity is greater (Lovetskaya, 1948). The differences between the two runs, with the exception of fecundity, have also been noted for Yukon River chums. All chums sampled in the Yukon River were collected from the summer run and the average fecundity of 2,323 eggs would be expected to be less than that of the fall chums.

The average number of eggs of Kwiniuk River chum salmon (2,981) would appear to be intermediate in range between the fecundity of summer and autumn chums of the Yukon River. It is interesting to note that the Kwiniuk River 4-year-old fish had a greater fecundity (about 200 more eggs) than the 5-year-olds. This difference may be due to insufficient sampling as only six of the 5-year-old fish were sampled. The apparent greater fecundity of the 4-year-old fish may be due to faster growth rates.

Pink Salmon: Conclusions reached from analyzing the Kwiniuk River pink salmon fecundity data should be regarded as tentative since the number of samples was limited and in addition, all ovaries were collected on the same date. The comparatively low fecundity (1,372 eggs) could be attributed to the small size of the fish (mean fork length of 44.9 cm). Pinks exhibit annual variations in length and weight that are associated with yearly

changes in abundance. In many areas pinks show strong flucuations in abundance in either odd or even years. During "weak" years the fecundity is usually higher as the size of the fish is larger. This trend in annual fecundity flucuations has been demonstrated in the Bolshaya River (Siberia) pink salmon (Kaganovskii, 1949). Sampling of Kwiniuk River pink salmon in 1966 may show a substantial difference in average fecundity when compared to the 1965 sample.

During 1966 an attempt will be made to collect larger, more respresentative fecundity samples from all age classes. Also, it is planned to sample in other areas, such as Kotzebue Sound and Kuskokwim River, so that additional comparisons can be made and to eventually obtain an overall pattern of fecundity for northwestern Alaskan salmon.

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Y U K O N R I V E R S A L M O N T A G G I N G S T U D I E S
1 9 6 5

The Flat Island tagging site was again operated in 1965. A total of 819 king and 1,065 chum salmon, captured with gill nets of varying mesh sizes and a single fishwheel, were tagged and released.

All tag and recovery data were entered on I.B.M. punch cards. The final tabulations of this data were received too late for analysis and inclusion in this report. A separate report will be issued at a later time.

R U N T I M I N G - Y U K O N K I N G S A L M O N

Figure 5 shows the daily numbers of king salmon counted or captured in various areas of the Yukon River drainage. Daily counts were obtained of king salmon passing through the Whitehorse dam facility. The remaining data represents the daily catches per unit of effort. The Flat Island catch was taken with gill nets operated by Department tagging crews. Catches from Paimiut, Ruby, Minto, and Fort Yukon were obtained from catch calendars submitted by subsistence fishermen. Each location is positioned according to its relative distance from Flat Island (Mile 0) in the south mouth. Finally, a line has been plotted from the x axes to connect (best fit) the peak catches of each location. This line indicates the migration rate of king salmon.

The June 20 peak at Flat Island, and peaks at Fort Yukon (Mile 1002) and Whitehorse (Mile 1745) can be fitted with a straight line as shown in Figure 5. This line intercepts Paimiut catches during a period of time when daily catches are missing. It is conceivable that the peak occurred during this time. This line also intercepts the Minto (Tanana River) catch about

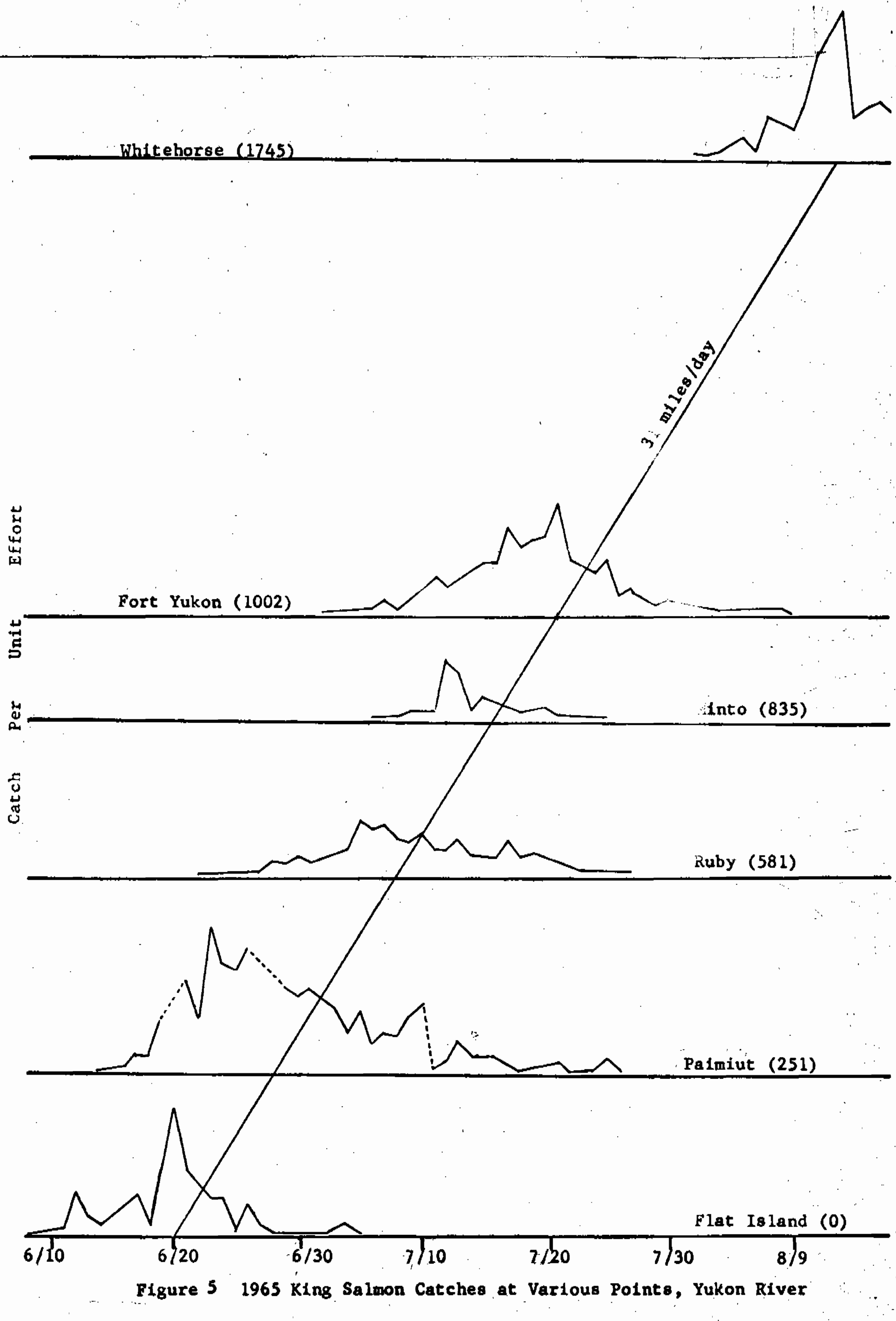

Figure 5 1965 King Salmon Catches at Various Points, Yukon River

3-4 days after the peak catch was made and about 1-2 days after peak catches were made in Ruby.

The slope of this line indicates that the 1965 king salmon run traveled about 31 miles a day. Similar analysis of 1964 data indicate a migration rate of 25-32 miles a day.

B E A U F O R T S E A S E I S M I C O P E R A T I O N

1965

By

Mortimer L. Henry
Fish and Game Aide III

Geophysical Services, Inc. under contract to British Petroleum, Inc. was given permission by the Alaska Department of Fish and Game to conduct an aquatic seismic exploration (Permit # A-Y-K 65-310) in the Beaufort Sea. Although the permit was in effect from July 15, 1965 to September 15, 1965, actual shooting occurred only from August 1, 1965 to August 26, 1965. Weather and the accumulation of flow ice prevented further completion of the operation plan.

Three different methods of shooting were employed. The first method, used from August 1 to August 18, was the most desirable. The survey boat went along the shot line marking each shot point and recording the water depths. One-half mile behind the survey boat, the tow boat pulled a one mile long cable with 24 hydrophones connected to it. When the recording boat reached a shot point, all motors were turned off and the charge was dropped approximately 300 feet from the middle of the cable by the shot boat. Once the shot area was cleared, the charge was set off by a radio signal and the energy impulses were recorded. The tow boat would then move the cable one-half mile up to the next shot point while the Fish and Game observer inspected the shot area for injured fish.

The second method was similar to the first method. Flow ice hindered navigation considerably and to compensate for this, the cable was doubled over

and tied together making the cable one-half mile long. The recording boat was used to tow the cable and also to record the energy impulses. The shot boat dropped the charge approximately 300 feet perpendicular to the middle of the cable. As a result, a charge was detonated every one-quarter mile instead of one-half mile. This method was used from August 18 to August 23.

The third method was used from August 23 to August 26. The cable was cut in half to make a single one-half mile long cable with 12 hydrophones. The shooting procedure was the same as the first method except the charges were detonated approximately 300 feet perpendicular to both ends of the cable before the cable was moved up to the next shot point. As a result, two charges were detonated at every shot point one-half mile apart.

Shooting occurred from Prudhoe Bay, Lat. 70°20'; Long. 148°20', to approximately 40 miles west of the Canadian border, Lat. 69°50'; Long. 142°20'. There is very little subsistence fishing in this area and no commercial fishing. Residents of the native village at Barter Island engage in some fishing activity, but they rely mainly on seal and caribou for food. Also, men who work on the various "DEW" line stations do some sport fishing for char.

A total of 522 charges, ranging from 16 2/3 pounds to 100 pounds of nitro-carbo-nitrate, were detonated in this area. A total of 205 whitefish, Coregonus sp., were killed by these blasts. In every case, fish were killed in sheltered waters such as around islands, sand bars, and in bays. No other species of fish were killed by shooting, but Arctic char, Salvelinus alpinus, and several varieties of sculpins, Cottidae sp., were caught in gill nets.

The "boil" of the blast varied from about 100 feet to 300 feet in diameter depending upon the size of the charge. A small tidal wave was also created which usually dissipated within 500 feet from the blast point. A silty bottom seemed to be apparent at most shot points because of the tremendous amount of blackish silt suspended in the "boil" after the blast. Also, no plants or invertebrates were observed floating near any shot point before or after any blast.

Upon several occasions, the beaches near shot points were explored for any signs of dead organisms washed upon the beach. Leafy-like plants and invertebrates could be found on these beaches at any time and were especially abundant after strong winds and storms. These beaches were examined approximately 12 hours after blasting in the areas. In every case, there was no apparent increase of dead organisms washed on the beach, and those organisms that were found had no apparent signs of death due to blasting.

Whitefish that were affected by the blast all seemed to suffer from similar injuries. All of the fish were found floating "belly-up" within the diameter of the "boil" or else within 25 feet of the edge of the "boil". They all had ruptured air bladders, kidneys, ribs, and abdominal muscles. In several cases, blood vessels in the gills and abdominal cavity were also ruptured. The drastic change of pressure of the water resulting from the explosion probably caused all of these injuries (Rulifson and Schoning, 1963 [1]). Also, several fish had noticeable burn marks on them.

An attempt was made to determine the depth and range of destruction caused by blasting to whitefish. Whitefish were caught in a gill net and placed at various depths and distances from the blast in wire-screened fish baskets.

1/ Rulifson, R. and Robert W. Schoning, Geophysical Offshore Oil Explorations and Associated Fishery Problems. Fish Commission of Oregon, April, 1963

These fish were sluggish and may have been in a state of shock because of the handling and transferring of the fish to the blasting site. After the blast, these fish were observed and dissected to determine the extent of injury. These results are shown in Table 58. All specimens placed within a 150 foot radius of the shot point were killed by the blast. The one specimen placed 300 feet from the shot point sustained no observable injuries by the blast. Because of the limited data, little can be concluded from this experiment. It is hoped a more comprehensive study of a similar nature will be conducted in the future.

An experimental whitefish gill net of one-half inch mesh (stretched measure) was used to collect specimens. The net was 50 feet long (two 25 foot nets tied together) and four feet deep. The net was fished at four different locations for a total of 155 hours (see Table). A total of 9 whitefish, 12 Arctic char, and 71 sculpins were caught during this time. A small representative sample of these fish, along with some whitefish killed by blasting, were preserved in a 10 percent formaldehyde solution for later identification.

Daily water temperatures were taken and ranged from 1.5°C to 7.0°C. It was noted that the water temperature near the ice pack was always at least several degrees colder than the water near land.

TABLE 57

Fishing Effort And Catches with an
Experimental Whitefish Gill Net ($1\frac{1}{2}$ Inch Mesh)
Beaufort Sea, 1965

Location	Date	Hours Fished	Whitefish	Arctic Char	Sculpin
Point Brower	8/3	9	0	2	0
Point Brower	8/3 - 8/4	13	1	0	6
POW III	8/8	13	2	1	0
POW III	8/8 - 8/9	11	0	0	0
Konganevik Point	8/12	11	0	0	14
Konganevik Point	8/12 - 8/13	13	4	0	6
Barter Island	8/16 - 8/17	13	1	2	3
Barter Island	8/17 - 8/18	24	0	2	6
Barter Island	8/18	13	0	0	4
Barter Island	8/18 - 8/19	11	0	3	13
Barter Island	8/19 - 8/20	24	1	2	19
TOTAL:		155	9	12	71

TABLE 58

EFFECTS UPON WHITEFISH DUE TO SEISMIC BLASTING

Date	Sample Number	(Pounds) Weight	Fork Length (cm)	Sex	Water Depth (feet)	Shot Depth (feet)	Pounds of Charge	Distance From Blast (feet)	Depth of fish (feet)	Injury
8/4/65	Exp. 1	0.9	32.0	Male	-	6	50	300	3	None
8/8/65	Exp. 2	1.0	34.8	Female	-	6	40	100	3	Massive Internal
8/8/65	Exp. 3	0.9	33.9	Male	32	6	50	100	3	Massive Internal
8/13/65	Exp. 4	1.0	33.5	Female	8	6	50	150	3	Massive Internal
8/13/65	Exp. 5	1.0	34.0	Female	8	6	50	150	3	Massive Internal
8/13/65	Exp. 6	0.9	31.5	Male	10	6	50	150	3	Massive Internal